PATENT ABSTRACTS OF JAPAN

(11)Publication number : **11-036981**

(43)Date of publication of application : **09.02.1999**

(51)Int.Cl. **F02G 5/04**
F02G 5/02
H01L 35/30
H01L 35/32
H02N 11/00

(21)Application number : **09-196084**

(22)Date of filing : **22.07.1997**

(71) Applicant : **NISSAN MOTOR CO LTD**
CALSONIC CORP

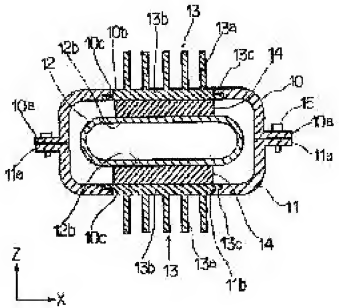
(72)Inventor : **SHINOHARA KAZUHIKO**
KUSHIBIKI KEIKO
KOBAYASHI MASAKAZU
FURUYA KENJI
AMADA KATSUMI

(54) EXHAUST HEAT POWER GENERATING DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To prevent a power generating function from being eliminated by preventing the peeling and damage of a thermoelectric converting module from occurring and to facilitate an assembly by simplifying a structure in an exhaust heat power generating device.

SOLUTION: This exhaust heat power generating device comprises a thermoelectric converting module 14 with a flat hot end surface and low temperature end surface; an inner pipe 12 in which the exhaust gas from an engine is circulated and a flat part 12b connected to the hot end surface of the thermoelectric converting module is provided at least on a part of its outer periphery; a heat radiating member 13 with a flat part 13b connected to the cold end surface of the thermoelectric converting module; and outer shells 10 and 11 which are arranged



around the inner pipe 12 at specified intervals and hold the heat radiating member 13 with smaller heat conductivity than the hear radiating member. The thermoelectric converting module 14 is fixedly held between the flat part 12b of the inner pipe 12 and the flat part 13b of the heat radiating member 13.

LEGAL STATUS

[Date of request for examination]	29.06.2001
[Date of sending the examiner's decision of rejection]	
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]	
[Date of final disposal for application]	
[Patent number]	3637365
[Date of registration]	21.01.2005
[Number of appeal against examiner's decision of rejection]	
[Date of requesting appeal against examiner's decision of rejection]	
[Date of extinction of right]	

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the exhaust heat power plant which collects the heat energy of the exhaust gas discharged from the exhaust gas which flows an internal combustion engine's exhaust pipe, or an incinerator, and generates electrical energy.
[0002]
[Description of the Prior Art] Conventionally, at an automobile, works, etc., the exhaust heat power plant currently indicated by JP,61-254082,A, JP,63-262075,A, and JP,7-307493,A is known as what collects the heat energy of the exhaust gas discharged from an engine (internal combustion engine), a furnace, etc., respectively, and is changed into power.
[0003] Drawing 1 shows the exhaust heat power plant currently indicated by JP,63-262075,A, and the endoergic cylinder 2 of the shape of a cube type equipped with the flat surface which counters the exhaust pipe 1 with which the exhaust gas discharged from the engine of an automobile flows is infixed in this exhaust heat power plant.
[0004] And the thermoelectrical conversion module 3 counters, and is arranged and the elevated-temperature end face of the thermoelectrical conversion module 3 and the flat surface of the endoergic cylinder 2 are joined by both the flat surfaces of the endoergic cylinder 2 by the screw thread or adhesion.
[0005] Furthermore, the low-temperature end face and water cooled jacket 4 of the thermoelectrical conversion module 3 counter, and are arranged, and the low-temperature end face of the thermoelectrical conversion module 3 and the cooling surface of a water cooled jacket 4 are joined by a screw thread or adhesion.
[0006] In the exhaust heat power plant mentioned above, the exhaust heat of the hot exhaust gas which flowed from the exhaust pipe 1 is transmitted to the elevated-temperature end face of the thermoelectrical conversion module 3 through the flat surface of the endoergic cylinder 2, and the low-temperature end face of the thermoelectrical conversion module 3 is simultaneously cooled with the cooling water which flows back the inside of a water cooled jacket 4.
[0007] And by a generation of electrical energy being performed by the thermoelectromotive force produced according to the Seebeck effect according to the temperature gradient produced between the elevated-temperature end face of the thermoelectrical conversion module 3, and the low-temperature end

face, the heat energy of exhaust gas is collected and it changes into power.

[0008] The exhaust heat power plant indicated by JP,61-254082,A is shown, and the container liner 6 which makes a circular cross-section configuration is infixed in the exhaust pipe 5 with which the exhaust gas discharged from the engine of an automobile flows in this exhaust heat power plant, and the outer case 7 with a circular cross-section configuration keeps predetermined spacing in the outside of this container liner 6, and drawing 2 is arranged concentric circular.

[0009] Furthermore, between the peripheral face of a container liner 6, and the inner skin of an outer case 7, as an elevated-temperature end face counters a container liner 6 side and a low-temperature end face counters an outer case side, two or more thermoelectric elements 8 are arranged in a circle.

[0010] In the exhaust heat power plant mentioned above, the exhaust heat of the hot exhaust gas which flowed from the exhaust pipe 5 is transmitted to the elevated-temperature end face of a thermoelectric element 8 through a container liner 6, and the heat of a low-temperature end face radiates heat outside through an outer case 7.

[0011] And by a generation of electrical energy being performed by the thermoelectromotive force produced according to the Seebeck effect according to the temperature gradient produced between the low-temperature edge of a thermoelectric element 8, and the elevated-temperature edge, the heat energy of exhaust gas is collected and it changes into power.

[0012] Furthermore, the exhaust heat power plant which looped around the thermoelectrical conversion module between the container liner of a cross-section circle configuration and the coat is indicated by JP,7-307493,A. In this exhaust heat power plant, as a thermoelectrical conversion module is formed in a special configuration and it can be equal to the heat deformation by the temperature gradient of a container liner and an outer case, it has the inside, a thermoelectrical conversion module or a thermoelectrical conversion module, and the composition of securing heat contact of an outer case.

[0013]

[Problem(s) to be Solved by the Invention] However, in the exhaust heat power plant indicated by above-mentioned JP,63-262075,A, since a cooling jacket 4 is fixed to the endoergic cylinder 2, the approach of adhesion, a screw-thread stop, etc. is taken.

[0014] Therefore, in immobilization by adhesion, there was a problem of being easy to cause disappearance of the generation-of-electrical-energy function by exfoliation of the thermoelectrical conversion module 3 or breakage by oscillation of a car etc.

[0015] Moreover, it is necessary to attach firmly using the metal screw of high intensity so that it may ****, and the water cooled jacket 4 which is a heavy lift may be attached through the thermoelectrical conversion module 3 at a hot heat collection portion in immobilization by the stop, therefore the variation rate by mechanical oscillation may not occur. Generally, since the metal had about 5 times [of the thermoelectrical conversion module 3] heat conductivity, the heat of a large quantity will flow into a water cooled jacket 4 via this screw section, and, thereby, it had the problem that the temperature gradient of the elevated-temperature edge of the thermoelectrical conversion module 3 and a low-temperature edge will fall substantially, and a generation-of-electrical-energy output will decline.

[0016] In the exhaust heat power plant indicated by above-mentioned JP,61-254082,A, since the thermoelectric element 8 was arranged in a circle, the area of an elevated-temperature edge became smaller than the area of a low-temperature edge, and there was a problem that the recovery effectiveness of the heat of exhaust gas was bad. Moreover, in order to install a thermoelectric element 8 so that good heat contact may be acquired, the problem that the ends side of a thermoelectric element 8 had to be

processed with high degree of accuracy was in both the wall surfaces of the container liner 6 of a circular curved surface, and a coat 7. Furthermore, equipment needed to be assembled incorporating the module which consists of several 100 or more thermoelectric elements 8 and electrodes between the direct container liner 6 and an outer case 7, and there was a problem that a production process became complicated.

[0017] In the exhaust heat power plant indicated by above-mentioned JP,7-307493,A, the thermoelectrical conversion module needed to be processed into the special configuration like ****, and there was a problem that it was difficult to form so that neither a crack nor a deficit may produce the thermoelectric element which is the sintered compact of a semi-conductor, and to produce to a large quantity, in this processing.

[0018] While this invention is attained in view of the trouble of the above-mentioned conventional technique, and the place made into the object heats an elevated-temperature end face with the heat carrier heated by the exhaust gas discharged from an internal combustion engine, a combustion furnace, etc., or these exhaust gas, on the other hand, raises the collector efficiency from a heat source in the exhaust-heat power plant which cools a low-temperature end face with heat carriers, such as air or cooling water, and aiming at buildup of a generation-of-electrical-energy output, it is shown in attaining miniaturization of equipment.

[0019] other objects of this invention using the thermoelectrical conversion module of the rectangular parallelepiped configuration where versatility is high, and reducing dispersion for that of the heat transfer engine performance from an elevated-temperature edge to a low-temperature edge -- manufacture -- it is in offering the exhaust heat power plant which can make it easy structure and can aim at buildup of a generation-of-electrical-energy output.

[0020] Other objects of this invention are to offer [thermal or] the exhaust heat power plant which can prevent the decline in the heat transfer effectiveness by breakage of the electric joint by mechanical oscillation, heat deformation, etc., lowering of the generation-of-electrical-energy output accompanying breakage of a thermoelectrical conversion module, etc.

[0021] Other objects of this invention are to offer the exhaust heat power plant which can reduce the manday of the assembly activity of two or more thermoelectrical conversion modules.

[0022] Other objects of this invention are compact and are to offer a reliable exhaust heat power plant.

[0023]

[Means for Solving the Problem] The thermoelectrical conversion module which has an elevated-temperature end face with the flat exhaust heat power plant concerning claim 1 of this invention, and a low-temperature end face, The inner tube which has the pars plana joined to the elevated-temperature end face of said thermoelectrical conversion module by a part of periphery [at least] while circulating a heating medium for higher temperature inside, The radiator material which has the pars plana joined to the low-temperature end face of said thermoelectrical conversion module, Have the attaching part which holds said radiator material while being arranged so that the surroundings of said inner tube may be set and predetermined spacing may be surrounded, and it has a coat with thermal conductivity smaller than the thermal conductivity of said radiator material. Said thermoelectrical conversion module has composition pinched between the pars plana of said inner tube, and the pars plana of said radiator material.

[0024] The exhaust heat power plant concerning claim 2 of this invention has composition which said coat consists of the 1st coat half object and the 2nd coat half object which are joined as surround the

periphery of said inner tube from both sides, and consists of a breakthrough trimmed in the shape of [which said attaching part is formed at least in one side of said 1st and 2nd coat half object, and said a part of radiator material suits] a complementary.

[0025] The exhaust heat power plant concerning claim 3 of this invention has the composition that said radiator material was pinched with said coat and said thermoelectrical conversion module, and was held in the burster-trimmer-stacker-feature field of said breakthrough.

[0026] The exhaust heat power plant concerning claim 4 of this invention has the composition that said radiator material was beforehand fixed to said coat [near the burster-trimmer-stacker-feature field of said breakthrough].

[0027] The exhaust heat power plant concerning claim 5 of this invention has the composition that said coat consists of a spring material.

[0028] The exhaust heat power plant concerning claim 6 of this invention has the composition that the buffer member which eases stress was prepared between the attaching part of the coat holding said radiator material, and said radiator material.

[0029] The exhaust heat power plant concerning claim 7 of this invention has the composition that the heat-insulating element was prepared in the field to which it is the space surrounded by said inner tube and coat, and said thermoelectrical conversion module and radiator material are not arranged.

[0030]

[Effect of the Invention] According to the exhaust heat power plant concerning claim 1 of this invention, the heat of heating media for higher temperature which flow the interior of an inner tube, such as combustion gas and high temperature steam, passes along the pars plana prepared in the inner tube, and the elevated-temperature end face of a thermoelectrical conversion module is heated.

[0031] Moreover, the low-temperature end face of a thermoelectrical conversion module is simultaneously cooled by the radiator material cooled with atmospheric air or cooling water.

[0032] According to the temperature gradient generated between the elevated-temperature edge of a thermoelectrical conversion module, and the low-temperature edge, electromotive force will arise by this, and a generation of electrical energy will be performed.

[0033] In this case, the heat conductivity of the coat which encloses an inner tube while holding radiator material is smaller than the heat conductivity of radiator material, and since the thermoelectrical conversion module has an inner tube and composition pinched among both the pars plana of radiator material, thermal contact sufficient between a thermoelectrical conversion module, an inner tube, and radiator material is secured. Therefore, most heat transmitted from a heating medium for higher temperature is led to a thermoelectrical conversion module, and it can generate electricity efficiently. Thereby, a generation-of-electrical-energy output can be raised.

[0034] Moreover, as for a thermoelectrical conversion module, the simple structure reason of being pinched between an inner tube and radiator material, and manufacture can be easy, can reduce dispersion in a heat transfer property, and, thereby, can raise the dependability on a function.

[0035] Since according to the exhaust heat power plant concerning claim 2 of this invention a coat is made into 2 block construction which consists of a 1st coat half object and a 2nd coat half object and it is considering as the structure where radiator material is held in the burster-trimmer-stacker-feature field of the breakthrough formed in the coat, to an inner tube, a thermoelectrical conversion module, radiator material, and a coat can be attached easily, and, thereby, reduction of attachment manday etc. can be attained.

[0036] Since immobilization of radiator material is performed by being pinched with a coat and a thermoelectrical conversion module in the burster-trimmer-stacker-feature field of a breakthrough according to the exhaust heat power plant concerning claim 3 of this invention, the separate components for immobilization are not needed, but while simplification of attachment is attained, thereby, low cost-ization of the product by the cutback of components mark is attained.
[0037] According to the exhaust heat power plant concerning claim 4 of this invention, since radiator material is being fixed beforehand in one to the coat, a thermoelectrical conversion module can be arranged between an inner tube and radiator material in the case of attachment, pinching immobilization can be carried out easily at it, and, thereby, attachment precision can be raised.
[0038] Since a coat is formed with a spring material according to the exhaust heat power plant concerning claim 5 of this invention, at the time of attachment Even when a thermoelectrical conversion module can be fixed to the pars plana of an inner tube by the equal pressure and an inner tube expands thermally with the heat from a heating medium for higher temperature The expansion pressure force accompanying this can prevent breakage of the thermoelectrical conversion module by the high pressure locally generated in both sides of the elevated-temperature edge of a thermoelectrical conversion module, and a low-temperature edge while it is eased by the elastic deformation of a coat and it can prevent fluctuation of the heat contact section in a thermoelectrical conversion module. Furthermore, dispersion in ****** between thermoelectrical conversion modules by which two or more installation was carried out can be reduced, the heating value which flows into each thermoelectrical conversion module can be held uniformly by this, and the generation-of-electrical-energy output stabilized extremely can be obtained.
[0039] According to the exhaust heat power plant concerning claim 6 of this invention, since the buffer member is prepared in the conclusion section of radiator material and a coat, at the time of attachment, a thermoelectrical conversion module can be fixed to the pars plana of an inner tube by the equal pressure, and deformation of an inner tube and a coat can be prevented. Furthermore, even when an inner tube expands thermally with the heat from a heating medium for higher temperature, the expansion pressure force accompanying this can be eased by the above-mentioned buffer member, and, thereby, deformation of an inner tube, a coat, radiator material, etc. can be prevented.
[0040] Moreover, dispersion in mutual ****** of the thermoelectrical conversion module by which two or more installation was carried out can be reduced, the heating value which flows into each thermoelectrical conversion module can be held uniformly by this, and the generation-of-electrical-energy output stabilized extremely can be obtained.
[0041] According to the exhaust heat power plant concerning claim 7 of this invention, by having prepared the heat-insulating element in the field to which it is the space surrounded by the inner tube and the coat, and a thermoelectrical conversion module and radiator material are not arranged, heat dissipation by **** from fields other than the pars plana of an inner tube can be prevented, the heat from a heating medium for higher temperature can be led to a thermoelectrical conversion module still more efficiently, and, thereby, a generation-of-electrical-energy output can be raised further.
[0042]
[Embodiment of the Invention] Hereafter, the example of this invention is explained based on an accompanying drawing.
[0043] Drawing 3 thru/or drawing 6 show the 1st example of the exhaust heat power plant concerning this invention. This exhaust heat power plant is equipped with the thermoelectrical conversion module

14 grade pinched by the inner tube 12 which lets the exhaust gas from the engine as a heating medium for higher temperature pass, the radiator material 13 held in this inner tube 12 at surrounding 9, i.e., the coat to surround, and this coat 9, the radiator material 13, and the inner tube 12 as shown in drawing 3 thru/or drawing 5 .

[0044] Here, it has flange 12a for connecting an inner tube 12 to an engine exhaust pipe (un-illustrating) in longitudinal direction both ends, and as the cross-section configuration of the body of tubing is shown in drawing 4 , pars-plana 12b which carries out phase opposite of the ellipse configuration elongated horizontally (the direction of X) in nothing and the vertical direction (Z direction) is formed.

[0045] As shown in drawing 3 thru/or drawing 6 , the above-mentioned coat 9 is divided in the vertical direction (Z direction), and consists of up shell 20 to which each carried out the character type of cross-section KO, and lower shell 11. And Breakthroughs 10b and 11b are formed in the field which counters the pars plana 12b and 12b of an inner tube 12, respectively in the condition of having attached to these up shell 10 and the lower shell 11 so that predetermined spacing might be set and an inner tube might be surrounded, and the radiator material 13 is incorporated and held in the field of these breakthroughs 10b and 11b. Moreover, one pair of ribs 10a and 11a for conclusion elongated to a longitudinal direction are formed in the junction field of the up shell 10 and the lower shell 11, respectively, each is joined and these ribs 10a and 11a for both conclusions are concluded by bolt 15 grade.

[0046] The above-mentioned radiator material 13 makes the role of the source of low temperature of the thermoelectrical conversion module 14, and consists of two or more cooling fin 13a which projects in the vertical direction, pars-plana 13b which extends horizontally in the root section of these cooling fin 13a, and level difference section 13c by which burster-trimmer-stacker-feature formation was carried out in the periphery section of this pars-plana 13b.

[0047] The above-mentioned thermoelectrical conversion module 14 has a flat elevated-temperature end face parallel to each other and, and a low-temperature end face, and generates thermoelectromotive force according to the Seebeck effect based on the temperature gradient produced in ends face-to-face.

[0048] In attachment of each part article which makes the above configurations As shown in drawing 4 and drawing 5 , first so that the elevated-temperature end face of the thermoelectrical conversion module 14 may stick to pars-plana 12b of an inner tube 12 The radiator material 13 is further arranged from a vertical outside so that the thermoelectrical conversion module 14 may be arranged from a vertical outside, then pars-plana 13b of the radiator material 13 may stick to the low-temperature end face of the thermoelectrical conversion module 14. Then, cooling fin 13a of the radiator material 13 passes through Breakthroughs 10b and 11b. And it is made for level difference section 13c of the radiator material 13 to fit into the level difference sections 10c and 11c (to refer to drawing 6) formed in the periphery section of Breakthroughs 10b and 11b so that the shape of this and a complementary might be made. The up shell 10 and the lower shell 11 are made to approach from a vertical outside, and it joins, and concludes with a bolt 15.

[0049] According to the above-mentioned configuration, each thermoelectrical conversion module 14 is pinched between pars-plana 12b of an inner tube 12, and pars-plana 13b of the radiator material 13, and it is certainly fixed, and the radiator material 13 will be pinched between the thermoelectrical conversion module 14 and a coat 9, and will certainly be fixed.

[0050] Moreover, as an ingredient of the up shell 10 which forms the above-mentioned coat 9, and the lower shell 11, an ingredient with each thermal conductivity smaller than the thermal conductivity of

radiator material, for example, a ceramic ingredient, stainless steel, etc. are used. Most heat emitted from an inner tube 12 can be led to the thermoelectrical conversion module 14, and, thereby, an efficient generation of electrical energy can be made to perform by forming a coat 9 with the ingredient of such low thermal conductivity.

[0051] moreover, the fixed holding power (pressure) of the thermoelectrical conversion module 14 pinched between a container liner 12 and the radiator material 13 by forming a coat 9 with spring materials, such as stainless steel, -- the up shell 10 and the lower shell 11 -- the stress produced in case it is uniformly secured according to each spring effectiveness and a container liner 12 expands thermally is also eased by the elastic deformation of these up shell 10 and the lower shell 11.

[0052] As a spring material which forms a coat 9, when using the thin stainless steel plate of 1mm - about 2mm of board thickness, here As shown in drawing 7 , the up shell 100 (refer to drawing 7 (a)) and the lower shell 110 (refer to drawing 7 (b)) are formed by die forming, such as press working of sheet metal, respectively. By making the edge of Breakthroughs 100b and 110b into a clinch configuration which projects in the vertical direction (Z direction) The flexural rigidity of the field in which Breakthroughs 100b and 110b were formed can be raised, and, thereby, the thermoelectrical conversion module 14 can certainly be fixed after attachment.

[0053] in addition, the case where the coat (the up shell 100, lower shell 110) shown in drawing 7 is used -- the radiator material 13 -- the level difference section 13c -- the up shell 100 and the lower shell 110 -- it is joined to the medial surfaces 100c (un-illustrating) and 110c (referring to drawing 7 (b)) of each breakthrough 100b and the 110b periphery section, and pinching immobilization will be carried out.

[0054] Drawing 8 thru/or drawing 10 show the 2nd example of the exhaust heat power plant concerning this invention. In this example, a coat 30 is not attached the back like [in the case of the above-mentioned example], and has fixed beforehand to the peripheral face of an inner tube 12 by the technique of soldering, welding, or a screw-thread stop in longitudinal direction both ends.

[0055] And on the occasion of attachment, the thermoelectrical conversion module 14 is inserted from breakthrough 30b prepared in the coat 30. So that an elevated-temperature end face may be stuck to pars-plana 12b of an inner tube 12 and pars-plana 22b of the radiator material 22 may stick to the low-temperature end face of the thermoelectrical conversion module 14 from on the The radiator material 22 is inserted and fitting of the flange 22c trimmed with the periphery section of pars-plana 22b is carried out to level difference section 30c of the spot facing configuration formed in the periphery section field of breakthrough 30b.

[0056] And as shown in drawing 9 which expanded the C section in drawing 8 , the buffer member 23 which eases stress etc. is made to intervene, and conclusion immobilization is carried out with a bolt 24.

[0057] According to the above-mentioned configuration, the stress produced at the time of attachment or thermal expansion can be made to be able to ease according to an operation of the buffer member 23 arranged between level difference section 30c as an attaching part of the coat 30 holding the radiator material 22 and flange 22c of the radiator material 22, and, thereby, it can fix according to the pinching force of a request of the thermoelectrical conversion module 14.

[0058] Drawing 11 and drawing 12 show the 3rd example of the exhaust heat power plant concerning this invention. In this example, while forming the buffer members 34, such as rubber, for a fundamental configuration further like the 1st example between the up shell 40 and the lower shell 41, and the

radiator material 33, it is considering as the configuration which formed the buffer members 35, such as rubber, in the conclusion field of both the shell 40 and 41 etc. similarly.

[0059] In the relation between the above-mentioned radiator material 33 and both the shell 40 and 41, as shown in drawing 12 (a), the buffer member 34 is put between the opposite field of level difference section 41c of breakthrough 41b prepared in the lower shell 41, and level difference section 33c formed in the pars-plana 33b periphery of the radiator material 33, for example.

[0060] On the other hand, as the conclusion field of both the shell 40 and 41 is shown in drawing 12 (b), the buffer member 35 is put between the opposite field of the ribs 40a and 41a for both conclusions, and buffer member 35' is put also between a bolt 36 and rib 40a for conclusion of the up shell 40, and conclusion is performed by making a nut 37 screw.

[0061] At the time of conclusion of the up shell 40 which forms a coat according to the above-mentioned configuration, and the lower shell 41 Or by compressing these buffer members 34 and 35 and 35' at the time of conclusion with coats 40 and 41 and the radiator material 33 While becoming possible to secure the heat contact to pars-plana 12b of the elevated-temperature end face of the thermoelectrical conversion module 14, and a container liner 12, and the low-temperature end face of the thermoelectrical conversion module 14 and pars-plana 33b of the radiator material 33 to homogeneity It can intercept from the inferior environment where an exhaust heat power plant sets the thermoelectrical conversion module 14.

[0062] Drawing 13 is the sectional view showing the 4th example of the exhaust heat power plant concerning this invention. In this example, as shown in drawing 13 , the cross section in which breakthrough 60b to which a cross section carries out maintenance immobilization of the radiator material 70 which counters the shape of an abbreviation hexagon 50, i.e., the inner tubes which have page [6th] pars-plana 50b, and such pars-plana 50b, and by which it is arranged was prepared the number of need pieces is equipped with the thermoelectrical conversion module 14 grade pinched between the coats 60 and 61 which make the shape of an abbreviation hexagon, and this radiator material 70 and inner tube 50.

[0063] Here, thermal conductivity is formed by coats 60 and 61 like the above-mentioned example with the metal or ceramics of the radiator material 30 smaller than thermal conductivity. Moreover, both conclusion is performed by a coat's considering as 2 division configurations which consist of up shell 60 and lower shell 61, and making a bolt 66 and a nut 67 screw on both sides of the buffer member 63 between each rib 60for conclusion a, and 61a.

[0064] The above-mentioned coat does not necessarily have to consider as vertical 2 division, and may fix what was divided into much shell from the above-mentioned approach in each rib part for conclusion.

[0065] Furthermore, in the corner E (they are five places when the number of pars plana is six) shown in drawing 13 , this coat should be connected on the hinge etc., should be united, and can also be fixed in the rib section of the start edge and termination which is not restrained on a hinge.

[0066] Moreover, this buffer member may be infixed between the radiator material 70 and coats 60 and 61.

[0067] Thus, since the thing of the configuration in which the cross section in a right-angled direction has much pars plana to the flow direction of exhaust gas as an inner tube 50 can also respond, this invention can respond to various demands to inner tubes, such as flow, a pressure, etc. of a heating medium for higher temperature, and can extend the application range for it further.

[0068] Drawing 14 is the sectional view showing the 5th example of the exhaust heat power plant concerning this invention. In this example, as shown in drawing 14 , it is considering as the configuration which thermal resistance is high to the field to which it is the space surrounded by an inner tube 12 and coats 10 and 11, and the thermoelectrical conversion module 14 and the radiator material 13 are not arranged, and the heat conductivity is small to it, for example, filled it up with the heat-insulating elements 80, such as glass, ceramic cotton, felt, and a bead.

[0069] According to the above-mentioned configuration, heat dissipation by **** from the field where it does not touch, the pars plana 14, i.e., the thermoelectrical conversion module, of an inner tube 12, can be prevented, and the heat from a heating medium for higher temperature can be led to the thermoelectrical conversion module 14 still more efficiently.

[0070] Although what has the pars plana which an inner tube becomes from the 2nd page which counters in an above-mentioned example, or the pars plana which consists of the 6th page was shown, it is not restricted to this and the thing of a configuration which has the pars plana which consist of a field of the other numbers can be adopted.

[0071] Moreover, although the above-mentioned example showed the case where the fin of air cooling was installed, as radiator material, a water cooled jacket etc. can be used.

[0072] Furthermore, as a buffer member used by this invention, heat-resistant silicone rubber, a carbon gasket, a metallic gasket, etc. can be used.

[Translation done.]

* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] The thermoelectrical conversion module which has a flat elevated-temperature end face and a low-temperature end face, and the inner tube which has the pars plana joined to the elevated-temperature end face of said thermoelectrical conversion module by a part of periphery [at least] while circulating a heating medium for higher temperature inside, The radiator material which has the pars plana joined to the low-temperature end face of said thermoelectrical conversion module, Have the attaching part which holds said radiator material while being arranged so that the surroundings of said inner tube may be set and predetermined spacing may be surrounded, and it has a coat with thermal conductivity smaller than the thermal conductivity of said radiator material. Said thermoelectrical conversion module is an exhaust heat power plant characterized by what is pinched between the pars plana of said inner tube, and the pars plana of said radiator material.
[Claim 2] It is the exhaust heat power plant according to claim 1 which said coat consists of the 1st coat half object and the 2nd coat half object which are joined as surround the periphery of said inner tube from both sides, and is characterized by what is consisted of a breakthrough trimmed in the shape of [which said attaching part is formed at least in one side of said 1st and 2nd coat half object, and said a part of radiator material suits] a complementary.
[Claim 3] Said radiator material is an exhaust heat power plant according to claim 2 characterized by what it is pinched with said coat and said thermoelectrical conversion module, and is held in the burster-trimmer-stacker-feature field of said breakthrough.
[Claim 4] Said radiator material is an exhaust heat power plant according to claim 2 characterized by what is being beforehand fixed to said coat [near the burster-trimmer-stacker-feature field of said breakthrough].
[Claim 5] There is no claim 1 characterized by what is consisted of a spring material, and said coat is the exhaust heat power plant of one publication 4 either.
[Claim 6] There is no claim 1 characterized by what the buffer member which eases stress is prepared for between the attaching part of the coat holding said radiator material and said radiator material, and it is the exhaust heat power plant of one publication 5 either.
[Claim 7] the space surrounded by said inner tube and coat -- claim 1 characterized by preparing the heat-insulating element in the field to which said thermoelectrical conversion module and radiator material are not arranged thru/or 6 -- the exhaust heat power plant of any one publication. [and]

[Translation done.]

* NOTICES *

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the appearance perspective view showing the conventional exhaust heat power plant.
[Drawing 2] It is the appearance perspective view showing the conventional exhaust heat power plant.
[Drawing 3] It is the appearance perspective view showing one example of the exhaust heat power plant concerning this invention.
[Drawing 4] It is a sectional view in the A-A section in drawing 3 .
[Drawing 5] It is a sectional view in the B-B section in drawing 3 .
[Drawing 6] The shell which constitutes the coat of the exhaust heat power plant concerning this invention is shown, (a) is up shell and (b) is the appearance perspective view of lower shell, respectively.
[Drawing 7] Other examples of a coat are shown, (a) is up shell and (b) is the appearance perspective view of lower shell, respectively.
[Drawing 8] The 2nd example of the exhaust heat power plant concerning this invention is shown, and it is a sectional view in a direction vertical to the flow direction of a heating medium for higher temperature.
[Drawing 9] It is the expanded sectional view which expanded the C section in drawing 8 .
[Drawing 10] The 2nd example of the exhaust heat power plant concerning this invention is shown, and it is a sectional view in the flow direction of a heating medium for higher temperature.
[Drawing 11] The 3rd example of the exhaust heat power plant concerning this invention is shown, and it is a sectional view in a direction vertical to the flow direction of a heating medium for higher temperature.
[Drawing 12] It is the elements on larger scale of the exhaust heat power plant shown in drawing 11 , and (a) is the expanded sectional view of the D section in drawing 11 , and (b) is the expanded sectional view of the conclusion parts of the upper part and lower shell.
[Drawing 13] The 4th example of the exhaust heat power plant concerning this invention is shown, and it is a sectional view in a direction vertical to the flow direction of a heating medium for higher temperature.
[Drawing 14] The 5th example of the exhaust heat power plant concerning this invention is shown, and

it is a sectional view in a direction vertical to the flow direction of a heating medium for higher temperature.

[Description of Notations]

9 Coat
10 Up Shell
10a The rib for conclusion
10b Breakthrough
10c Level difference section
11 Lower Shell
11a The rib for conclusion
11b Breakthrough
11c Level difference section
12 Inner Tube
12b Pars plana
13 Radiator Material
13b Pars plana
13c Level difference section
14 Thermoelectrical Conversion Module
22 Radiator Material
22b Pars plana
22c Flange
23 Buffer Member
24 Bolt
30 Coat
30b Breakthrough
30c Level difference section
33 Radiator Material
33c Level difference section
34, 35, 35' Buffer member
36 Bolt
37 Nut
40 Up Shell
40a The rib for conclusion
41 Lower Shell
41a The rib for conclusion
41b Breakthrough
50 Inner Tube
50b Pars plana
60 Up Shell
60a The rib for conclusion
60b Breakthrough
61 Lower Shell
61a The rib for conclusion

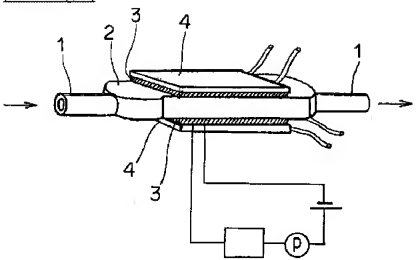
61b Breakthrough
63 Buffer Member
66 Bolt
67 Nut
70 Radiator Material
80 Heat-insulating Element
100 Up Shell
100a The rib for conclusion
100b Breakthrough
110 Lower Shell
110a The rib for conclusion
110b Breakthrough
110c Medial surface

[Translation done.]

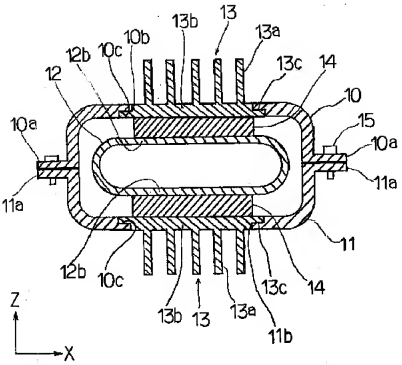
* NOTICES *

DRAWINGS

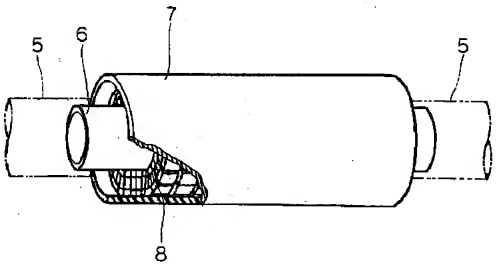
[Drawing 1]



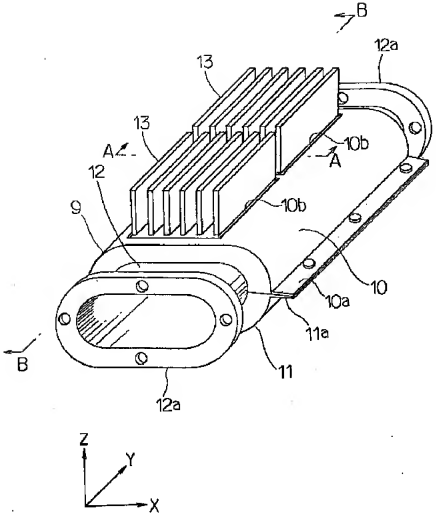
[Drawing 4]



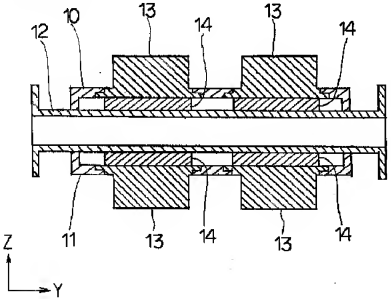
[Drawing 2]



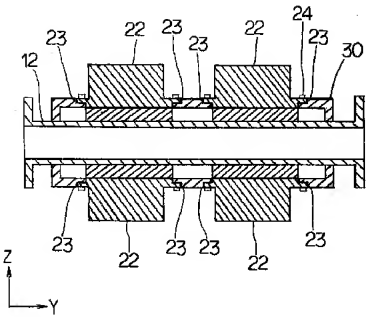
[Drawing 3]



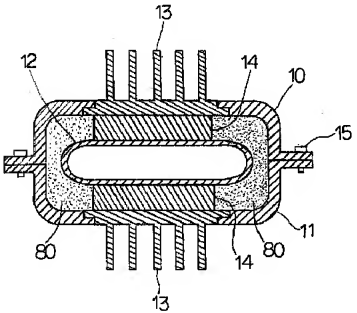
[Drawing 5]



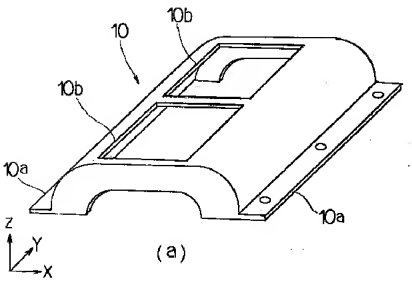
[Drawing 10]

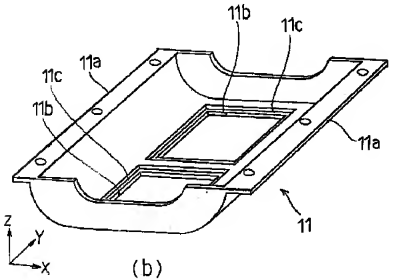


[Drawing 14]

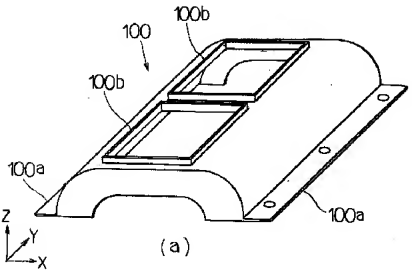


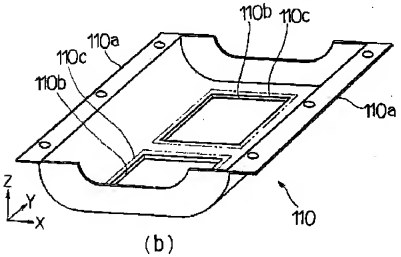
[Drawing 6]



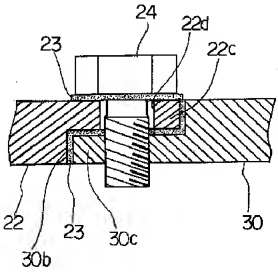


[Drawing 7]

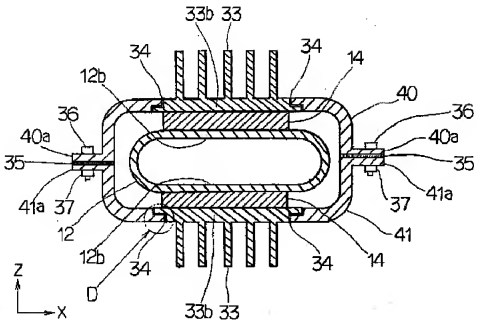

100b
100
100b
100a
100a
Z
Y
X
(a)


110b
110c
110a
110c
110b
110a
Z
Y
X
110
(b)

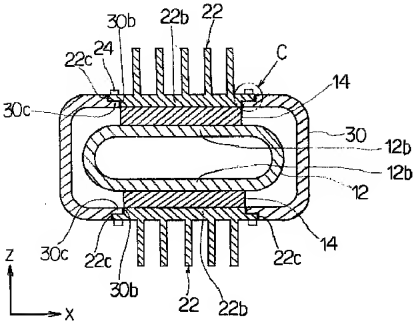
[Drawing 9]



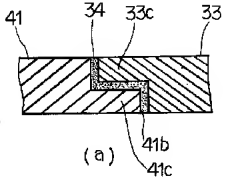
[Drawing 11]

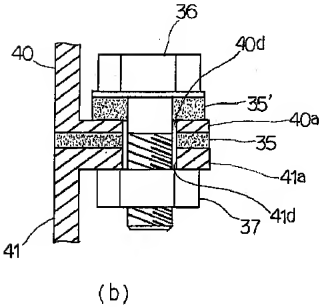


[Drawing 8]

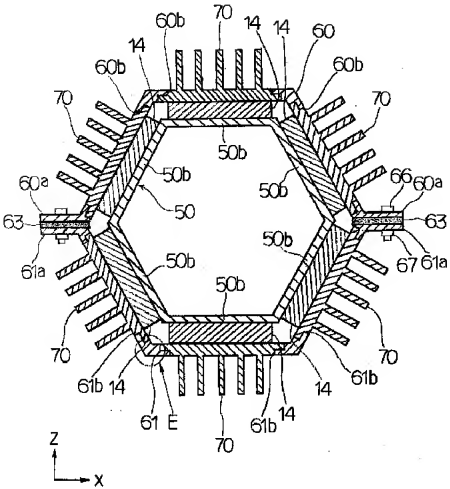

30b
22b
22
22c
24
C
14
30c
30
12b
12b
12
30c
22c
14
22c
Z
30b
22
22b
X

[Drawing 12]





[Drawing 13]



[Translation done.]